Concept for Scalable Chemical Micro-Reactor Utilizing Phononic Waves Shaped by Samples of Desired Output Chemical Ideal for Hydrocarbon and Pharmaceutical Synthesis at Point-of-Need

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Introduction

When it comes to chemical synthesis, some chemicals may be produced with relative ease whereas others require a great deal of energy to produce and must be produced in a centralized location.

If specific chemical compounds could be produced in energy-efficient micro-reactors, chemicals could be produced locally without the need to transport them. For military purposes, this is crucial given that land vehicles and aircraft are dependent upon the delivery or hydrocarbon-based fuels via contested routes. The delivery of fuel by tanker to bases and encampments in a war zone is dangerous not only for the tanker drivers, but risks the unavailability of both diesel and aviation fuels. If these fuels could be produced at the point of need, the capability would bestow a tactical advantage.

On the domestic front, pharmaceuticals often require energy-intensive, multi-step processes for chemical synthesis. For both military hydrocarbon-manufacture applications and the synthesis of other chemicals, the ability to construct whole chemical chains in a single step regardless of complexity has been a longstanding aspiration of chemists.

At the most fundamental, chemical reactions require that building blocks pass within close proximity to one another and oftentimes require energy in the form of heat to encourage molecular motion that makes the union of atoms more likely.

Abstract

In some cases, substantial heat is required for electron bonds to be established as there needs to be kinetic force to push elements together, overcoming their natural repulsion. There is no rule that says that force has to be generated exclusively by heat, however, it must come from somewhere. For some exotic chemicals, heat causes molecular chains to break and other methods must be used to coax the elements together. In any case, for a micro-reactor to be practical, it must both produce substantial quantities of the desired compound in a timely manner using as little energy as possible.

Working from a principle similar to the principle of phononic particulate conglomeration described in November, it should be possible to produce useful quantities of specific chemicals using nothing but raw elements as well as phononic energy injected into an aqueous medium containing the component elements. Crucial to such a process would be shaping that phononic energy by passing sound waves through 'sample molecules' of the

desired output chemical in order to corral component elements into the desired configuration.

A sample of the chemical to be replicated would be semi-permanently affixed to a phonon-emitting wall of a six-walled cubic micro-reactor. A mirror image of this molecule would be affixed to the opposite phonon-emitting wall and the floor would contain a microscopic IR LASER to provide needed heat to support the creation of molecular bonds of the collocated elements.

The remaining two side-walls would be used to inject materials and the ceiling of each cube would accept and carry away molecules that have completed the synthesis process. In the case of hydrocarbons, these will naturally float to the top.

By placing a sample molecule of the desired chemical in close proximity to the phonon source, a sound wave with a deficit in strength that has a shape that conforms with the structural shape of that specific chemical is emitted. Just as with the phononic particulate conglomeration system, sound that passes through the solids in the water are conducted at a higher speed than through the water. In the case of our phononic chemical replication system, if a molecule of the desired chemical is suspended in place against a phonon-emitting wall and the initial phononic intensity is reduced dramatically, the dynamics would be different. Whereas the particulate conglomeration system described in November has as its objective using circulating phonons created by acceleration of select phonons caused by the density of the particulate and the associated phononic vacuum to pull particulates toward one another and toward the bottom of the container, in this case, the object is to corral specific combinations of elements into a specific area in a specific configuration.

Each chemical element has a unique relationship with sound, particularly in an aqueous environment. Each element creates its own distinct, measurable vibrational wake when suspended in water caused by thermal motion. This wake has been measured in previous studies as a potential asset in an experimental form of aqueous interferometry microscopy. As a principle, this means that every element emits, over very small distances, its own sound, particularly when suspended in water.

This means that carbon, with its six protons, has greater capacity, given its density, to effectively block phonons through mutual annihilation versus an element such as hydrogen. Whereas in our phononic particulate conglomeration system, more powerful sound waves were used and the mode of action was the differential in the speed of conduction of sound through disparate materials, in this case, extremely weak phonons would be employed that can be partly absorbed by interaction with a carbon atom, for instance. In this case, the presence of a sound wave in all spatial areas except for the target area should have the effect of causing atoms not in the target area to migrate toward that area and remain there once they have arrived. This is guaranteed by the fact that two ultraweak phononic waves that approach the combinant atom from two directions after passing through an atom of the same type will have a frequency that is resonantly matched to that specific element, ensuring both that the combinant atom finds its equilibrium in the correct place and that the wrong element does not occupy the place of the

desired one. Sound waves that are of the resonant frequency of carbon, no matter how well-balanced, will not corral a nitrogen, for instance, but would push it aside.

To provide the initiating force to propel the basic elements into the general vicinity of the center of each cubic micro-reactor, phonons would be emitted from all six walls in alternation at what may be termed "high power mode." This causes the reactor to move material around turbulently rather more like a washing machine. Nonetheless, this step is necessary for ensuring that enough of each prerequisite element passes into the target area and that the process is completed in a timely manner.

Once this turbulation is generated, the low-power mode is enabled and ultraweak phonons finesse the elements into place, using one standard and one chiral mirror molecule of the desired element as a blueprint, as already described.

Intelligent guidance of the process is not necessary as the length of time each micro-reactor should perform each step would be predetermined.

The finishing step, of course, would be the emission of IR light to heat the elements while continuing to inject ultraweak shaped phononic energy to hold the molecule's shape during the bonding of the molecular chain. Ideally, all links in the chain would be united simultaneously, which is quite different from the multi-step chemistry to which we have been accustomed historically.

Conclusion

Completed molecules can then float to the top of the reactor, be exfiltrated by osmosis, and transported to a larger storage vessel. Early prototypes may need to be compound-specific or specific to one class of compound e.g. those that float versus those that sink in water.